PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	Joseph FERNANDO et al	Docket No.:	UNF-9058 A
Serial No:	09/560,469	Examiner:	HIEN TRAN
Filed:	April 28, 2000	Group No.:	1764
For:	Support Element For Fragile Structures Such As Catalytic Converters		

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APPELLANTS' REPLY BRIEF UNDER 37 C.F.R. §41.41

Dear Sir:

This is an appeal to the Board of Patent Appeals and Interferences (the "Board") from the Final Rejection set forth in the Office Action mailed February 11, 2004. A Notice of Appeal was filed by Appellants on March 8, 2004, and was received by the USPTO on March 11, 2004. Appellants filed their Appeal Brief on June 14, 2004. An Examiner's Answer was mailed on September 9, 2004. Appellants hereby respectfully submit their Reply Brief under 37 C.F.R. §41.41.

ARGUMENT

Issue A

Appellants acknowledge that the rejection of claims 8, 9, and 19-25 under 35 U.S.C. §112, second paragraph has been withdrawn.

Issue B

Claims 1-27 and 41-44 were finally rejected under 35 U.S.C. §103 over United State Patent No. 5,580,532 ("US '532"), in view of JP 07-286,514 ("JP '514") and GB 1,481,133 ("GB '133"). The final rejection of claims 1-27 and 41-44 has been maintained.

The following allegations have been maintained:

- that US '532 discloses a device comprising a housing, a fragile structure mounted in the housing, and a support element disposed between the housing and the fragile structure, where the support element comprises an integral, non-expanding sheet of ceramic fibers containing alumina and silica having an average diameter of 1-10 microns;

- that JP '514 discloses a ceramic fiber mat disposed between a catalyst and a housing, where the ceramic fibers of the mat have been heat treated at a temperature of 1000-1300°C for an effective amount of time to produce a crystalline structure having 0-10% crystallinity;

- that GB '133 discloses providing ceramic fibers for thermal insulation and heat treating fibers at 950°C to 1050°C from 10 minutes to 1 hour to produce fibers having a certain crystallite size.

Thus, it is alleged that it would have been obvious to one having ordinary skill in the art to heat treat the ceramic fibers of US '532 to form fibers having a percent crystallinity as allegedly disclosed by JP '514 and a crystallite size as allegedly disclosed by GB '133.

Appellants respectfully traverse the rejection under 35 U.S.C. §103(a). To establish a *prima facie* case of obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). To establish a *prima facie* case of obviousness, there must be some suggestion or motivation to modify a reference or to combine reference teachings, there must be a reasonable expectation of success, and the prior art must teach or suggest all claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills,* 916 F.2d 680, 16USPQ2d 1430 (Fed. Cir. 1990).

The presently claimed support element comprises an integral, substantially non-expanding ply of melt-formed ceramic fibers containing alumina and silica. In one embodiment, the fibers of the support element are prepared by heat treating the fibers under a time-temperature regimen of heat treating at 990°C to at least 1050°C for ***greater*** than 1 hour such that the fibers have about 5 to about 50 percent crystallinity as detected by x-ray diffraction, and a crystallite size of about 50Å to about 500Å. In another embodiment, the fibers are heat treated under a time-temperature regimen of heat treating at a temperature of ***greater*** than 1050°C for an effective amount of time such that the fibers have about 5 to about 50 percent crystallinity as detected by x-ray diffraction, and a crystallite size of about 50Å to about 500Å.

The Present Invention is Non-Obvious in View of US '532.

The Final Office Action and the Examiner's Answer allege that the present claims are product-by-process claims and, therefore, the relevant inquiry is whether the product itself is patentable over the prior art. Appellants do not dispute this position, but respectfully submit that they have met their burden of providing evidence that US '532 does not expressly or inherently disclose, suggest, or provide motivation for the all of the limitations of the presently claimed product.

The present claims recite limitations directed to the percent crystallinity of the fibers of the support element, the crystallite size of the crystalline structure of the fibers of the support element, and the holding force performance of the support element of the exhaust gas treatment device. By contrast, US '532 does not disclose, suggest, or provide motivation for the percent crystallinity or crystallite size of the crystalline structure of the fibers of the support element, or the holding force capabilities of the support element of the exhaust gas treatment device. Thus, when taken alone, US '532 does not disclose, suggest, or provide motivation for an exhaust gas treatment device of the present claims.

On Page 5 of the Examiner's Answer, it is stated that "Appellants argue that US '532 does not disclose the motivation to heat treat ceramic fibers of the support element under any time-temperature regimen." However, Page 6 further states that "such contention is not persuasive as although US '532 is silent as to whether the ceramic fibers in the support element may be heat treated to crystalline form as claimed, the secondary references are relied upon for such teaching." Applicants wish to point out to the Board, as they have described hereinabove, US '532 does not provide any teaching, suggestion, or motivation to heat treat the ceramic fibers under any time-temperature regimen. Therefore, Applicants' remarks set forth in its Main Brief are indeed persuasive inasmuch as they correctly state that US '532 does not disclose, suggest, or provide motivation for heat treating ceramic fibers.

GB '133 Teaches Away From the Presently Claimed Time-Temperature Regimens

Appellants maintain that GB '133 expressly teaches away from the time-temperature regimens of claims 1 and 12 of the present invention. GB '133 discloses only one time-temperature regimen for heat treating ceramic fibers, namely, heat treating ceramic fibers at a temperature in the range of 950°C to 1050°C for 10 minutes to 1 hour.

By contrast, the present invention discloses two separate and distinct time-temperature regimens for heat treating ceramic fibers. The time-temperature regimen of claim 1 recites heat treating ceramic fibers at a temperature of about 990°C to at least 1050°C for ***greater*** than 1 hour. The time-temperature regimen of claim 1 is outside GB '133, because GB '133 is strictly limited to a heating time period 10 minutes to 1 hour. Furthermore, GB '133 expressly and unequivocally teaches to terminate the heating subsequent to formation of the crystalline product, but prior to the onset of excessive grain growth. See page 1, lines 83-92. Based on the express teachings of GB '133 as a whole, one having ordinary skill in the art would be not motivated to heat treat ceramic fibers at the devitrification temperature for a period of time greater than 1 hour.

The time-temperature regimen of claim 12 recites heat treating ceramic fibers at a temperature of ***greater*** than 1050°C for an effective amount of time such that the fibers have about 5 to about 50 percent crystallinity as detected by x-ray diffraction, and a crystallite size of about 50Å to about 500Å. The time-temperature regimen of claim 12 is outside of the time-temperature regimen of GB '133, because GB '133 is strictly limited to a heating temperature of 950°C to 1050°C. The devitrification temperature of the alumino-silicate ceramic fibers of GB '133 is about 950°C. GB '133 clearly teaches that "...the use of an excessive temperature above the devitrification temperature, or use of a sufficient devitrification temperature held for an excessive period of time, will tend to produce a coarse-grained structure with poor handling properties." See page 2, lines 97-

101. In view of the GB '133 teachings, one having ordinary skill in the art would not be motivated to heat treat ceramic fibers at a temperature above 1050°C, as this regimen of heat treating, according to GB '133, would render the resulting fibers incapable of achieving the performance objectives desired in GB '133. Therefore, Appellants respectfully submit that one having ordinary skill in the art would not be motivated to heat treat alumino-silicate ceramic fibers above a temperature of 1050°C.

Applicants have established that GB '133 does not disclose, suggest, or provide motivation to heat treat ceramic fibers under the presently claimed time-temperature regimens. There is also no suggestion or motivation to combine GB '133 with US '532. US '532 does not disclose or suggest that the ceramic fibers of the support element are, or should be, heat treated in order to perform the required functions of the support element. Heat treating ceramic fibers is simply not addressed or contemplated by the disclosure of US '532. Furthermore, GB '133 does not disclose, suggest, or provide motivation to utilize the fibers disclosed therein in an exhaust gas treatment device. Furthermore, there is no teaching or suggestion that heat treating ceramic outside the time-temperature regimen disclosed by GB '133 would produce a ceramic fiber having good mechanical properties and the ability to exert a holding pressure of at least 4 psi. Applicants respectfully submit that the teaching to incorporate a support element of heat treated ceramic fibers into an exhaust gas treatment device is derived only from their present application, and that the combination of GB '133 and US '532 is a result of improper hindsight analysis. Appellants also submit that there is no teaching or disclosure that the fibers of GB '133 exert any minimum holding pressure, or are suitable for use as mounting mats in catalytic converters. Accordingly, Applicants respectfully submit that there is no motivation to combine GB '133 and US '532. Additionally, the proposed combination of GB '133 and US '532 still does not teach or suggest the claim limitations of percent crystallinity and holding force performance of the support element in an exhaust gas treatment device.

JP '514 Does Not Teach Any Time-Temperature Regimen For Heat Treating

JP '514 does not teach, suggest, or provide motivation to heat treat ceramic fibers under a time-temperature regimen of (i) heat treating said fibers at a temperature of at least 990°C to less than about 1050°C for greater than one hour, or (ii) heat treating said fibers at a temperature of greater than 1050°C for a time effective such that the fibers have at least about 5 to about 50 percent crystallinity as detected by x-ray diffraction, and have a crystallite size of from about 50Å to about 500Å, and the claimed minimum holding force.

Melt Formed Fibers

Claims 1 and 12 of the present invention recite that the ceramic fibers of alumina and silica are melt formed ceramic fibers.

US '532 is limited to the use of sol-gel derived fibers in the formation of a support element for exhaust gas treatment devices. US '532 discloses that polycrystalline oxide ceramic fibers are used for preparing the mounting mat of the catalytic converter, and that suitable polycrystalline oxide fibers are contained in U.S. Patent Nos. 4,159,205 and 4,277,269. These two U.S. patents are directed to sol-gel processes for preparing ceramic oxide fibers from solvent solution. See column 5, lines 50-64.

JP '514 discloses that the fibers are formed by a sol-gel process whereby an organic binder such as polyvinyl alcohol, alumina sources such as alumina oxychloride, silica sources such as silica sol, and water are mixed together and then spun into an alumina fiber precursor. JP '514 does not disclose or suggest that melt formed ceramic fibers are useful in the formation of a support element for exhaust gas treatment devices.

Present Claim 4

With respect to present claim 4, the aluminosilicate fibers of the support element are melt formed fibers and comprise from about 40 weight percent to about 60 weight percent alumina and from about 60 weight percent to about 40 weight percent silica. By contrast, the fibers of JP '514 are strictly limited to fiber compositions having a weight ratio of Al_2O_3:SiO_2 of 70:30 – 74:26. See Abstract (Pages 1 and 2); Claim 1; and Page 4, Lines 3-7. JP '514 expressly teaches that when Al_2O_3:SiO_2 ratio is not in the range of 70:30 – 74:26, fiber deterioration occurs prematurely and the fibers do not withstand long usage. See Page 4, Lines 4-7. In view of the teachings of JP '514, there is no disclosure, suggestion, or motivation to utilize aluminosilicate fibers having a weight ratio of Al_2O_3:SiO_2 that is outside of the range of 70:30 – 74:26 in the formation of a support element for an exhaust gas treatment device. Present claim 4 recites a weight ratio of Al_2O_3:SiO_2 that is clearly outside of the weight ratio disclose by JP '514. Accordingly, Applicants respectfully submit that claim 4 is allowable over JP '514.

Comparative Testing

To support Appellants' position that the present claims are novel and non-obvious differences relative to the prior art product disclosed in GB '133, Appellants have provided the Office with results of comparative testing between the presently claimed product and the prior art product. Nevertheless, the Examiner has alleged that the claims are not commensurate in scope with the test results.

Appellants disagree with the Examiner's position on this point. Inventive examples 1-10 were compared to Comparative examples A-D. Comparative examples C and D are alumino-silicate fiber blankets that were heat treated in accordance with the teachings of GB '133, namely, at a temperature of 1050°C for 30 minutes or 1 hour.

Inventive examples 4-10 are melt-formed alumino-silicate fiber blankets, but that were heat treated in accordance with the time-temperature regimens of the present invention. The results of this comparative testing demonstrates that alumino-silicate fibers can be heat treated well above 1050°C or for periods of time much longer than 1 hour. This is in direct contravention to the teachings of GB '133. Therefore, Appellants again urge the Board not to dismiss the importance of the results of the comparative testing reported by Appellants.

In conclusion, Appellants respectfully submit to the Board:

- that US '532 does not disclose, suggest, or provide motivation to heat treat ceramic fibers, or to use heat treated ceramic fibers in the formation of a support element for an exhaust gas treatment device;

- that US '532 does not disclose, suggest, or provide motivation to use sol-gel derived fibers in the formation of a support element for an exhaust gas treatment device;

- that GB '133 is limited to heat treating ceramic fibers under a time-temperature regimen of heat treating at 950°C to 1050°C for 10 minute to one hour, and that GB '133 does not disclose, suggest, or provide motivation for the presently claimed time-temperature regimens;

- that GB '133 does not disclose, suggest, or provide motivation to utilize heat treated ceramic fibers in the formation of a support element for an exhaust gas treatment device and therefore there is no motivation to combine GB '133 with either US '532 or JP '514;

- that GB '133 does not disclose, suggest, or provide motivation for a mat of heat treated ceramic fibers possessing the presently claimed percent crystallinity, crystallite size, or holding force performance capabilities;

- that JP '514 does not disclose the presently claimed time-temperature regimens for heat treating ceramic fibers; and

- that JP '514 is strictly limited to the use of sol-gel derived fibers for use in the formation of a support element for an exhaust gas treatment device.

In view of the deficiencies of each of the prior art references cited, whether taken alone or in combination, Appellants respectfully submit that claims 1-27 and 41-44 are patentable. Thus, Appellants respectfully request the Board to withdraw the 35 U.S.C. §103(a) rejection. Appellants further respectfully request the Board to reverse the Final Office Action in this case and to direct the Examiner to issue a formal Notice of Allowability for claims 1-27 and 41-44. Should the Board have any questions, Appellants' undersigned attorney would welcome a telephone call.

Respectfully submitted,

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